

IV. *On the Indian Species of Balanophora, and on a new Genus of the Family Balanophoreæ. By the late WILLIAM GRIFFITH, Esq., F.L.S. &c. &c.*

Read June 18, 1844.

**BALANOPHORA**, *Forst. Nov. Gen.* 50. *Jussieu, Gen. Pl.* 445. *Richard in Mém. du Mus.* viii. 431. *Endl. Melet. fasc.* 1, 12; *Gen. Pl.* 74. no. 718. *Cynopsole, Endl. Gen. Pl.* 74. no. 719. *Langsdorffia, Arnott (non Martius) in Hooker, Ic. Plant.* t. 205, 206.

CHAR. GEN. *Flores mono-dioici. Masculi* bracteâ suffulti. *Perianthium* 4- (rariùs 3- v. 5-) sepalum, æstivatione valvatum. *Stamina* monadelphâ, 3-5, sepalis opposita (in *B. polyandrá* indefinita); *antheræ* (specie polyandrâ exceptâ) biloculares. *Rudimentum pistilli* nullum. *Flores fœminei nudi. Ovaria* simplicia, unilocularia, in stylos subulatos persistentes producta, plura in stipitibus communibus apice glanduloso-ampliatis ex axi spicæ oriundis sita. *Fructus* sicci, formâ situque ovariorum. *Ovulum* pendulum ex apice ovarii cavitatis (in *B. polyandrá* tantùm observatum). *Embryo* indivisus, albuminiformis, carnosus-cereus.

*Plantæ radicum parasiticæ, fœmineæ fungiformes. Caules squamis loco foliorum imbricati, ex axi communi irregulari lobatâ, fungorum instar, erumpentes. Capitulum terminale, pro mole plantæ maximum, cylindraceo-conicum. Masculi et fœminei in speciebus mihi cognitis declines. Flores masculi odoris sæpiùs ingrati, ochroleuci vel pallidi, sæpiùs anthesi peractâ nigrescentes. Antheræ magnæ. Flores fœminei numerosissimi, minuti, simplicissimi. Pistilla Muscorum et Hepaticorum quorundam pistilla omninò simulantia. Stigma verum obsoletum.*

OBS.—Specierum diagnosis difficilis, in posterum speciminum vivorum accuratiore examinatione corrigenda. Odor et color partium fusiùs notandi.

1. **BAL. BURMANNICA**; dioica, squamis laxè imbricatis, bracteis truncatis parùm canaliculatis, columnâ staminum elongatâ, antherarum oculis basi discretis. (TAB. III.)

*Hab.* Regnum Burmannicum, ad pedes clivorum calcareorum prope speluncas Trochla editas, fluminis Salween.

Flores masculi 5-sepali; perianthium extùs carneum demùm sanguineum.

2. *BAL. AFFINIS*; dioica, squamis laxè imbricatis, bracteis truncatis parùm canaliculatis, columnâ staminum brevi subrotundâ, loculis antherarum basi confluentibus. (TAB. IV.)

*Hab.* Colles Khasiyani, in umbrosis rupestribus.

*Bal. Burmannicâ* minor, an verè distincta? Perianthium 4-5-sepalum, pallidum. Antheræ inter se minùs cohærentes.

3. *BAL. ALVEOLATA*\*; dioica, squamis arètè imbricatis, bracteis profundè canaliculatis inter se favi instar dispositis, columnâ staminum subrotundâ. (TAB. V.)

*Hab.* Colles Khasiyani, in sylvis densis apud Lumbree alt. 6000 ped., et in locis umbrosissimis sub rupibus calcareis, Churra Punjee, alt. 4000 ped.

An *B. dioica*, R. Br. ? † Statura quàm in *Bal. Burmannicâ* minor. Color pallidus. Axis communis insigniter verrucosa. Flores masculi longiusculè pedicellati. Perianthium et stamina speciei præcedentis.

4. *BAL. PICTA*; dioica, squamis distantibus laxis (luteis), spicâ fœmineâ oblongâ obscurè sanguineâ. (TAB. VI.)

*Hab.* Montes Mishmecenses, jugi Himalayani, Laimplang Thayah, altitudine 4000-5000 ped.

5. *BAL. (Polyplethia) POLYANDRA*; dioica, columnâ stamineâ brevi latâ, antheris indefinitis. (TAB. VII.)

*Hab.* Colles Khasiyani.

Digitalis; squamæ laxè imbricatæ, sæpè aspectu subverticillatæ. Spica mascula elongata. Bracteæ vix canaliculatæ. Flores distantiores, lati, 4-sepali. Caput columnæ transversè oblongum, loculis numero indefinitis reticulatum. Spica fœminea oblonga vel subglobosa.

In the Catalogue of the East Indian Herbarium distributed by Dr. Wallich, the following names occur: *Balanophora dioica*, R. Br.; *Bal. Indica*, Herb. Wight; *Bal. typhina*, Wall.; and *Bal. gigantea*, Wall., doubtfully proposed as an undescribed genus, *Sarcocordylis*‡. Of these, three are probably identical with species herein described, but I have no means of ascertaining the fact.

\* By *alveolata* I wish to express the honeycombed appearance of the male spike.

† There is little doubt that this is really the species named *Bal. dioica* by Mr. Brown in Dr. Wallich's List, no. 7246, and figured in Dr. Royle's 'Illustrations,' t. 78 a.—SECR.

‡ *Bal. gigantea*, Wall. List, no. 7249, "Gen. Nov.? *Sarcocordylis*, Wall.," is a true *Balanophora*, and

OBS. I.—I have experienced considerable doubt in referring these plants to *Balanophora*.

In all my notes, especially those made while associated with Dr. Wallich, during the Tea Deputation into Upper Assam, I have considered them, from that botanist's suggestions, to be species of his *Sarcocordylis*, rather than of *Balanophora*.

In M. Endlicher's 'Genera Plantarum,' the character of *Balanophora*, with the exception perhaps of that of the female, seems considerably different from that of the plants in question, which is rather that of *Cynopsole*\*; but that genus, although its female flowers would seem to have been unknown, is placed in a tribe characterized by having a bilocular ovarium! Indeed, up to the time of my reaching the Botanic Gardens, I had no grounds whatever for referring these plants to *Balanophora*, except a figure in Dr. Royle's 'Illustrations†,' which is stated to represent the *Bal. dioica* of Mr. Robert Brown‡, a Nepalese plant referred by him to *Balanophora* in his memoir on *Rafflesia*§. My doubts, however, did not entirely end here; for in Forster's figure of *Bal. fungosa*, on which he founded the genus, the spikes are represented as bearing male flowers below and female above, a remarkable circumstance; the receptacles would also appear to bear pistilla over their whole surface. Then again, so late as 1838, Dr. Walker Arnott represents a plant in Hooker's 'Icones Plantarum,' which, excepting the apparent want of bractæ to the male flowers, and the appearance of the styles, perhaps to be explained by the adherence of pollen-grains, is evidently a congener of Mr. Brown's *Bal. dioica*, and of the species I have endeavoured to illustrate. Thus Dr. Arnott makes a *Langsdorffia*, a genus which appears to me sufficiently distinct from the *Balanophora* of Forster.

I have no later information regarding these plants, although probably Dr. Arnott has elucidated them in the 'Annals of Natural History.' I believe

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apparently not distinct from *Bal. globosa*, Jungh. in Nov. Act. Acad. Nat. Cur. vol. xviii. suppl. 1. p. 210. t. 2; *Bal. Indica*, Herb. Wight (illustrated by Dr. Arnott in Sir W. J. Hooker's 'Icones Plantarum,' t. 205-6, and in the 'Annals of Natural History,' vol. ii. p. 36), is distinct from any other published species; and *Bal. typhina*, Wall. List, no. 7248, appears to be identical with *Bal. picta*, Griff., above characterized.—SECB.

\* Genera Plantarum, 74. no. 719.

† Illustrations of Botany, &c. t. 99. or 78 a.

‡ Illustrations of Botany, &c. p. 330.

§ Linn. Trans. xiii. p. 227, in a note.

also the *Balanophoreæ* of Java have received some attention, but I am ignorant of the results\*.

Obs. II.—My materials for illustrating these plants are extensive, consisting of drawings of one species made from the recent plants, and of a plentiful series of specimens preserved in spirits.

All the species agree in having an amorphous tuberiform mass, which may be considered as the common axis. This mass is firmly united to the woody system of the roots of the stock, which are ramified in its substance, the bark ceasing along the places of union. The cellular tissue of the mass adheres firmly to the divisions of the roots, which appear to terminate in an abrupt manner. Some of the specimens look like zoophytes adhering to foreign bodies. This common mass or axis is much lobed; the surface is always more or less, and often to a high degree verrucose, the verrucæ being variously lobed, and having an appearance that suggests the idea of their being of an excretory nature. Internally the common mass is mainly composed of cellular tissue, the cells in many instances containing nuclei, and often viscid matter. The vascular bundles are many, without any very evident arrangement, except towards the axes or stems, to which they will be found to converge. They are composed of lax fibres, filled (after maceration at least) with grumous tissue, and short, annular, sometimes partly unrollable vessels.

Within the common mass the buds are developed, being protected during their earlier stages by the superficies of the mass, as well as by their own scales, which are then very closely imbricated. The buds subsequently protrude through the common covering, derived from the superficies of the mass, which remains in the shape of an irregularly torn annulus or wrapper.

The flower-bearing axes or stems, which appear perhaps generally to be one to each lobe of the common mass, are not isochronous in development. Instead of leaves they present imbricated uncoloured scales. The main bulk of the stem is of nucleary cellular tissue, traversed by longitudinal vasculo-fibrous fascicles, which supply the scales. In the female spikes these are

\* Since I wrote the memoir on *Balanophora*, I have seen Junghuhn and Gæppert's papers in the 'Nova Acta Academiæ Naturæ Curiosorum,' but I cannot get them translated. At any rate, my conclusions were derived independently of the papers alluded to.—*Mr. Griffith in a Letter to Mr. R. H. Solly, dispatched from Calcutta April 10th, 1843.*



much ramified in the circumference, but they do not, I think, pass into the receptacles or into any of the pistilla.

The scales have no cuticle or internal cavities, they never present green colouring matter, and are generally colourless and blackened about their points. They are of a fleshy substance, and are provided with several simple vascular fascicles.

The bracteæ, which are only developed in the male spikes, are fleshy, abruptly truncate, and more or less canaliculate. In the species in which they are most so, owing to their lateral edges being partly at least in apposition, the flowers appear enclosed in alveoli; and this is particularly evident after the fall of the flowers, when the head of the spike presents a honey-combed appearance. *Bal. dioica*, as represented in the figure cited\*, would appear to have cyathiform or involucelliform bracteæ; this probably is a mistake. The vascular bundles are obsolete, appearing rather as streaks of discoloured tissue; in them I have only observed fibres similar to those surrounding the vessels in the longitudinal bundles of the axis.

The perianthium, which exists only in the male, is composed of 4 or 5 sepals; if 5, the fifth is anticous; their æstivation is valvate, their substance fleshy. I have not detected in them any vascular fascicles, although there is some appearance of their existence within each margin.

The stamina are completely monadelphous, and, except in *Bal. polyandra*, are equal in number and opposite to the segments of the perianthium. From having observed certain irregular appearances in the anthers of *Bal. alveolata* (see TAB. V. fig. 8.), I think that the type of the anthers of *Bal. polyandra* may still be reduced to that of the other species. The centre of the antheriferous part of the column has presented one or two large patches of discoloured tissue. The anthers are very large, consisting of two large cells folded longitudinally into the shape of a horseshoc; they have no endothecal special apparatus; they open longitudinally; their number and structure are best ascertained before dehiscence. The pollen presents nothing peculiar.

The female stems are, so far as regards scales, &c., like those of the male, but they present no bracteæ, although round the base of the head there appears a tendency in some to their development.

\* Royle's Illustrations, t. 99, or 78a.

The female spike to the naked eye has a papillose and a subverrucose appearance; under an ordinary magnifier it appears covered with truncate, areolate, opaque bodies, separated from each other by what appear to be hairs. The truncate areolate bodies will be found on examination to terminate small branches of the spike, on which are arranged (and perhaps exclusively so) the pistilla or female flowers, the styloid terminations of which are the hairs alluded to.

These pistilla are generally stalked, and appear to be entirely composed of cellular tissue, every cell containing a nucleus. The ovarium is generally ovate, and presents externally the appearance of having a cavity containing a nucleus. This would seem to be its true structure, judging from *Bal. polyandra*. It is gradually attenuated into a style, which, in its earlier stages at least, is closed at the apex, and does not present any surface like that of an ordinary stigma. The tissue before fecundation is transparent and uncoloured; subsequently to that, the style becomes more or less, often completely, obscured by brown colour.

The ovulum, which was only observed in *Bal. polyandra*, and probably in its impregnated state, appeared to be pendulous from the apex of the cavity of the ovarium; its constitution was essentially similar to that of the matured embryo. Of its earlier stages I have no knowledge.

The pistilla at very early periods are mere ovato-conical extensions of the surface of the spike round the bases of larger extensions of the same surface, which subsequently form the receptacles.

There is very little difference beyond discoloration and a brittleness of tissue between the pistilla of the other species and the fruits of *Bal. picta*, in which alone I have observed them in their seemingly ripe state; they have nearly the same size and precisely the same disposition.

The embryo in this species appeared to be free; it is a cellular, undivided, albuminous-looking body, of a fleshy, waxy substance; the cells which compose it are rendered opaque by grumous, molecular and oleaginous matter, which by pressure may be made to escape into the fluid of the field of the microscope in the form of globular bodies of unequal size, which, as I have mentioned, might be mistaken for spores or grains of pollen.

Obs. III.—The most remarkable parts of the structure of this genus ap-

pear to me to be, the extraordinary simplicity of the female flowers, and the remarkable productions of the surface of the spike on which they are arranged.

From not having observed any change in the numerous pistilla (previously to examining *Bal. polyandra* and *Bal. picta*), although the browning of the style, and in some cases adherence of pollen-grains to it, had been distinctly seen, doubts had suggested themselves to me regarding the true nature of the above parts; and these were increased by examinations at very early periods, which did not present any state of the (subsequent) pistilla at all analogous to what occurs perhaps universally in Phænogamous Angiospermous plants; and also by the permanence and evident importance of the termination of the remarkable receptacles. The same apparent imperfection of the female flowers appears to have struck most observers\*; and prior to the determination of the point by the examination of the two species alluded to, I was inclined perhaps to consider this remarkable genus as presenting, at least in the specimens before me, an instance of abortion of pistilla, connected with a remarkable gemmiform apparatus.

The resemblance of the pistilla to the pistilla of *Musci*, and more especially to those of some evaginulate *Hepaticæ*, is exceedingly curious and complete; and the same may be said of the effects produced by the action of the pollen on the styles. Indeed, in the development of the female organ, the continuous surface of the style before fecundation, and its obvious perforation after †, *Balanophora* presents a direct affinity to a group of plants, with which otherwise it has not a single analogy.

If these highly remarkable points of structure are borne in mind, I think that it must be conceded that *Balanophora* can in no wise be associated with such highly-developed families as *Rafflesiaceæ* and *Cytineæ*, which, especially the former, are in my opinion to be taken as exhibiting a highly complex formation of even both sexes.

\* See Arnott's characters in Hooker's Icon. Pl., *loc. cit.* &c.

† In *Bal. (Polyplethia) polyandra* it is not uncommon to find grains much like the pollen-grains, and nearly of the same size, adhering to the style. Generally I have observed them adhering to it a little below the apex. The discoloration and lengthened maceration hindered me from tracing them down the canal of the style, which in this species was rarely observed to present so wide a separation or laceration of the parts forming its extreme apex as in the other species.



Obs. IV.—In the present state of our knowledge the *locus naturalis* of the family to which this genus belongs must, it appears to me, at best be founded on conjecture. The assistance of physiology is in the first place essential. Of all the notions\* however regarding it, that of Agardh, as given by Endlicher and Schott in their '*Meletemata*' †, appears to me the most plausible, although he would seem to include *Cynomorium* in the family, and to make it the typical genus. Although I have not observed these plants to have milky juice, or am inclined to lay much stress on some of the signs of affinity given by Agardh, yet in the separation of the sexes, the valvular æstivation of the perianthium, and the apposition of the stamina to its component parts, there are perhaps some signs of affinity; and although the development of the pistilla of *Balanophora* appears to me an insurmountable objection, still they resemble in texture the pistilla of some *Urticææ* as much, if not more, than those of any other plant.

As a mere hypothesis, then, I would consider *Balanophorææ*, judged of chiefly by *Balanophora*, as the homogeneous embryo form of *Urticinææ*, forming a direct passage in one, and usually the more perfect structure, to *Musci* and *Hepaticææ*. But in this, as in all other very doubtful cases, it is much more advisable to consider them as aliens than to force them into any sub-kingdom, class or order. As aliens, every observing botanist's eye will be upon them. As undoubted citizens, they may find, under authority, places anywhere, and will certainly cease to be general objects of observation.

#### PHÆOCORDYLIS, *Griff.* ‡

CHAR. GEN. Sexus declines. *Mas*: ignotus. *Fem.*: *Ovaria* nuda, in axi spicæ sessilia, pilis cellulosis (paraphysiformibus) immersa. *Stylus* filiformis, deciduus (exsertus).

\* Richard considered it allied to *Hydrocharidææ* and *Aroideæ* and *Aristolochiææ*, especially *Cytinus*, and to be placed between the former, which terminate the Monocotyledonous, and *Aristolochiææ*, which commence the Dicotyledonous series (*Ann. Mus.* viii. 434). Almost all writers seem to consider it as Monocotyledonous.

† Fasc. 1. p. 9. Obs. II.

‡ This genus approaches very closely to *Rhopalocnemis*, as described by Junghuhn in the '*Nova Acta Academiæ Naturæ Curiosorum*,' vol. xviii. suppl. 1. p. 213; but appears to differ in the absence of the extraordinary structure of the "fila globulifera" attributed to that genus by its author.—



*Stigma* obtusum. *Fructus* siccus, pilis (immutatis) immersus, compressus, striatus, apice papillosulus.

Planta robusta, habitu et evolutione *Balanophoræ*, tota brunnea. Spica oblonga, areolata, oculo nudo velutina.

Genus *Balanophoræ* vicinum, discrepans præsentia pilorum paraphysiformium, pistillo perfectiore, stylo deciduo, fructuque apice papillosulo.

#### PHÆOCORDYLIS AREOLATA.

*Hab.* In sylvis densissimis Collium Khasiyanorum, ad Mumbree; altitud. 6000 ped.

*DESCR.* Axis informis, subglobosa, carnosæ, superficie verrucosâ; verrucæ simplices vel sæpiùs variè lobatæ. Caules clavati, spithamæi vel pedales, erecti, basi annulo volvari variè diviso cincti. Squamæ (loco foliorum) carnosæ, horizontales, obsoletè pyramidales, (apicibus planis truncatis,) parvæ, subspiraliter dispositæ, infimæ approximatae, superiores distantiores. Spica crassa, oblonga, aspectu ferrugineo-velutina, obsoletè areolata, areolis centro elevatis. Pili (paraphysiformes) densissimè aggregati, superficiem ferè totam spicæ occupantes, lineari-clavati, rariùs simplices, frequentius e cellularum oblongarum seriebus binis vel imò ternis conflati, apice emarginati vel 3-dentati. Cellulæ basin versus diaphanæ, globulas diaphanas, inæquales, in massulas irregulares congestas continent; cellulæ apicis rotundatæ, materie grumosâ obscuratæ. Fructus pilis obsiti et immersi, sessiles, basi latâ affixi, oblongo-elliptici, compressi, longitudinaliter striati, apice subpapilloso, cicatrice styli obscurè notati, brunnei. Pericarpium siccum, subcrustaceum. Embryo carnosus-cereus, albus, aspectu albuminis, pendulus? compositus e cellulis irregularibus mutuè firmè adhærentibus, materie moleculari repletis. Pistilla abortiva plura; ovaria oblonga, compressa, ferè plana, striata, 1-locularia; stylus longè exsertus, filiformis; stigma obtusum.

*OBS. I.*—This species was only observed in an advanced state and of one sex in the journey of the Assam Deputation across the Khasiya Hills, A.D. 1835–36.

*OBS. II.*—The general anatomy of this plant appears to be the same as that of *Balanophora*. The vessels however appear to be more developed; they are scarcely unrollable. It is not so remarkable as *Balanophora* for the presence of nuclei in the component parts of the cellular tissue.

Its parasitism would appear to be precisely the same. The chief difference in habit from *Balanophora* arises from its larger annulus and its more minute scales, which rather resemble the bractæ of the male flowers of *Balanophora* than the scales (or leaves) of that genus.

OBS. III.—In the description which I originally made, there are remarks which would lead me to suspect that a perianthium, or something analogous to it, (in which case it would approach nearer to *Scybalium*,) may exist; but in my later examinations, by which I have been guided on this point, I find no trace of any tube enveloping the style.

The abortive pistilla have a considerable resemblance to those of *Balanophora*, but the tissue is much less lax and is obscured by brown colour. Although there have appeared to me to be traces of a cavity in the upper part of each, I have not been able to ascertain the existence of any body analogous to an ovulum, or any pre-existing state of the subsequent embryo. The structure of the style is also perhaps more indicated by analogy than by actual observation, owing to its opacity.

OBS. IV.—The results of all the examinations of the fruits have been the same; the embryo appears to be entirely cellular, and not to present any obvious attachment. The cellular tissue is dense and firm; if viewed under pressure and by transmitted light, it appears to be homogeneous, the cells containing a mucilaginous fluid and much molecular matter.

This matter on its escape carries along with it an envelope of mucilage, and assumes, when perfectly free in the field of the microscope, a globular appearance. It may in this state be easily mistaken for a spore, or a grain of pollen deprived of its outer coat.

OBS. V.—The structure of the hairs in which the fruits are imbedded is remarkable, from the analogy it appears to me to present with the paraphysisiform appendages of *Drepanophyllum* and certain *Neckeræ*, and also with the bodies which I suspect are the male organs of *Filices*.

OBS. VI.—I am ignorant whether this plant is a congener of or the same with *Balanophora gigantea*, doubtfully proposed by Dr. Wallich as a new genus in his Catalogue, No. 7249\*.

OBS. VII.—The genus I take to differ essentially from *Balanophora* by the presence of the remarkable paraphysisiform hairs or processes which cover the surface of the spike, by the areolation of this part, the sessile solitary ovaria, deciduous styles, and the subpapillose apex of the fruit. The conformation of the pistillum is also on the whole more perfect.

\* See note † on p. 94.—SECR.

*Langsdorffia* of Martius\* (not Arnott†) differs in the absence of the areolation and the peculiar hairs, the stalked ovaria crowned with papillæ, and the highly developed stigmatic surface. With the females of both *Helosis* and *Scybalium* it agrees in the structure of the hairs and of the fruit, although the ovarium of both these genera evidently appears to be composed of two carpella, and that of *Scybalium* to be actually bilocular.

The nakedness of the apex of the ovaria, connected with the papillose appearance of the apex of the fruit, seems to me to indicate that the appearances which have caused the ovaria of *Helosis*, and especially of *Scybalium*, to be described as inferior, may originate in an early development of the papillæ.

To endeavour to make this account of *Balanophora* and *Phæocordylis* more complete, I subjoin distinctive characters of the genera to which I would at present limit the natural family *Balanophoreæ*.

#### A. MONOSTYLI.

**BALANOPHORA**, *Forst. Nov. Gen.* 50. *Jussieu, Gen. Pl.* 445. *Richard, Mém. du Mus.* 8, 431. *Endl. Mel. Bot. fasc.* 1. 12; *Gen. Pl.* 74. no. 718. *Cynopsole, Endl. Gen. Pl.* 74. no. 719. *Langsdorffia, Arnott in Hook. Icon. Plant.* t. 205, 206.

*Sexus* dielines, rarissimè monoclines. *Flores masculi* bracteati. *Perianthium* 3-5-sepalum, æstivatione valvatum. *Stamina* 3-5, sepalis opposita, monadelphæ (in *Bal. polyandrá* indefinita). *Flores fæminei*: *Ovaria* stipitata, plura receptaculo communi ex axi spicæ oriundo apice incrassato-glanduloso affixa, nuda. *Stylus* setaceus, persistens. *Stigma* inconspicuum. *Fructus* pistilliiformes, sicci.

**LANGSDORFFIA**, *Mart. Nov. Gen. Sp. Plant. Bras.* 3. 181. t. 299, 298 *ex parte*. *Richard, Mém. du Mus.* 8. 412 *et* 430. t. 19. *Endl. Mel. Bot. fasc.* 1. 12. *Gen. Pl.* 74. no. 722.

*Sexus* dielines. *Flores masculi* bracteati. *Perianthium* 3-sepalum, æstivatione valvatum. *Stamina* 3, sepalis opposita, monadelphæ. *Flores fæminei*: *Ovaria* stipitata, ex axi

\* *Nov. Gen. Sp. Plant. Bras.* 3. 181. t. 298, 299.

† In Hooker, *Icones Plant.* t. 205, 206.



spicæ ipsâ orta. *Stylus* filiformis, basi tubulo papilloso cum ovarii parietibus continuo circumcinctus. *Stigma* subclavatum, papillosum. *Fructus* — ?

PHÆOCORDYLIS, Griff.

*Sexus* diclines. *Mas*: ignot. *Flores* *feminei*: *Ovaria* in axi ipsâ sessilia, nuda, pilis paraphysiformibus immixta. *Stylus* filiformis, exsertus, deciduus. *Stigma* subcapitatum. *Fructus* compressi (striati), apice subpapilloso.

B. DISTYLI.

HELOSIS, Richard, *Mém. du Mus.* 8. 416 et 430. t. 20. *Mart. Nov. Gen. Sp. Pl. Bras.* 3. 184. t. 300 et 298 ex parte. *Endl. Mel. Bot. fasc.* 1. 11; *Gen. Pl.* 74. no. 721.

*Sexus* monoclines. *Flores* pilis paraphysiformibus immixti: *masculi* ebracteati. *Perianthium* 3-sepalum. *Stamina* incompletè monadelphia. *Antheræ* connatæ, introrsæ!! *Flores* *feminei*: *Ovaria* in axi ipsâ subsessilia, quasi calyculo coronata.—Caules *squamis nisi ad imam basin orbati!*

SCYBALIUM, Endlicher. *Schott in Endl. Mel. Bot. fasc.* 1. 3. t. 2; *Gen. Pl.* 74. no. 720.

*Sexus* diclines. *Flores* *masculi* pilis paraphysiformibus et filis (*auct. Endl.*) immixti, ebracteati. *Perianthium* 3-sepalum. *Stamina* monadelphia; *antheræ* apices versus dehiscentes. *Pistilli* rudimentum intra tubum filamentorum! *Flores* *feminei*: *Ovaria* pilis paraphysiformibus tantùm immixta, sessilia in ipsâ axi, limbulo subpapilloso coronata.

ADNOT.—*Ombrophytum*, Schott et Endl., et *Lophophytum*, Poeppig, genera vix ritè cognita, vel hucusque dubia, et certè in posterum reinvestiganda, meliùs extra limites familiæ interim locanda. Genus *Cynopsole*, Endl., delendum.

EXPLANATION OF THE PLATES.

TAB. III.

*Balanophora Burmannica.*

- Fig. 1. Male plant:—natural size.  
Fig. 2. Alabastrum.  
Fig. 3. The same, just expanding.  
Fig. 4. Vertical view of apex of columna staminea in a pentamerous flower.  
Fig. 5. Lateral view of a tetramerous flower.  
Fig. 6. Endothecium.  
Fig. 7. Pollen in its natural state. *a.* The same, in water (triplet  $\frac{1}{3}$ ). *b.* The same, after long maceration in spirits ( $\frac{1}{30}$  m.).  
Fig. 8. Female plant:—natural size.  
Fig. 9. Apex of spadix: squamæ reflexed, showing that abortive bractæ do exist.  
Fig. 10. Portion of spadix.  
Fig. 11. Portion of the female inflorescence.  
Fig. 12. Portion of transverse section of bulbiform mass (irregular base of axis).  
Fig. 13. Portion of transverse section of stem.

TAB. IV.

*Balanophora affinis.*

- Fig. 1. Male plant:—natural size.  
Fig. 2. Flower just opening.  
Fig. 3. Expanded flower.  
Fig. 4. Endothecium, portion of.  
Fig. 5. Pollen, moist.  
Fig. 6. The same, immersed in water.  
Fig. 7. Longitudinal half-section of stem.  
Fig. 8. Portion of one of the vascular bundles.  
Fig. 9. Attachment to the root of the stock.  
Fig. 10. Young bud, and part of the base of the plant.  
Fig. 11. Another, more advanced: enclosing superficial layer removed.  
Fig. 12. Bud considerably more advanced: superficial layer ruptured.  
Fig. 13. Female plant:—natural size.  
Fig. 14. Longitudinal section of stem and inflorescence.

Fig. 15. Transverse section of a portion of the flower-bearing part.

Fig. 16. Portion of spadix; one series of corpora pistilliformia, with the corpus terminale.

Fig. 17. Corpus pistilliforme, unfecundated?— $\frac{1}{150}$  m.

Fig. 18. The same, fecundated:— $\frac{1}{150}$  m.

TAB. V.

*Balanophora alveolata.*

Fig. 1 & 1 a. Portions of male plants:—natural size.

Fig. 2. Portion of another plant, with a much less warty common axis.

Fig. 3. Alabastrum from fig. 1, just opening.

Fig. 4. Alabastrum, opened, of fig. 1.

Fig. 5. Columna staminea of fig. 2. This presents a variety in the structure of the front anther.

Fig. 6. Pollen:—magnified 550 times.

Fig. 7. Female of fig. 1.

Fig. 8. Portion of a female of fig. 2.

Fig. 9. Corpora pistilliformia and corpus terminale of fig. 7.

Fig. 10. The same, of fig. 8.

Fig. 11. Unfecundated? corpus pistilliforme of fig. 8:—magnified 200 times.

Fig. 12. The same, fecundated?—magnified 200 times.

Fig. 13. Portion of a very young flowering axis; the smaller more conical bodies are young pistilla.

Fig. 14. Another, more advanced.

Fig. 15. Apex of a styloid prolongation of a corpus pistilliforme, about the same period as fig. 14:—magnified 550 times.

Fig. 16. Apex of another, after sphacelation:—magnified 550 times.

TAB. VI.

*Balanophora picta.*

Fig. 1. Female plant:—natural size.

Fig. 2. Pericarpia and terminal body.

Fig. 3. Pericarpium.

Fig. 4. The same, with the chief part of the style removed, and the parietes laid open to expose the central body.

Fig. 5 & 6. Central body.

All but 1 & 2 measured, under an object-glass,  $\frac{1}{4}$  of an inch focal distance.



TAB. VII.

*Balanophora (Polyplethia) polyandra.*

- Fig. 1. Male plant :—natural size.  
Fig. 2 & 3. Alabastra, seen vertically.  
Fig. 4. Alabastrum, forcibly expanded.  
Fig. 5. Columna staminea.  
Fig. 6. A flower.  
Fig. 7. The same, with the sepals reflexed forcibly, viewed laterally.  
Fig. 8. Transverse double section of columna staminea.  
Fig. 9. Endothecium.  
Fig. 10. Pollen; measured under object-glass  $\frac{1}{16}$ .  
Fig. 11. A female plant :—natural size.  
Fig. 12. Pistilla and glandular-headed axes.  
Fig. 13. Pistillum, separate. *a, a.* The nucleary appearance, seen externally, due to the cavity in the pistillum. *b.* The young embryo: this is supplied from fig. 15.  
Fig. 14. Apex of a style of a young and apparently abortive pistillum :— $\frac{1}{330}$  m.  
Fig. 15. Pistillum, upper half torn open; the opaque circular line represents the boundary of its cavity, in the upper part of which is the young embryo.  
Fig. 15*a.* Embryo detached; the apex is torn a little. I could make nothing out of the filament by which it is attached, even under  $\frac{1}{330}$ .  
Fig. 16. Upper part of a pistillum, with its style similarly laid open, showing the embryo increased in size; a pollen-grain? adheres to the style a little below its apex :—magnified about 200 times.  
Fig. 16*a.* Apex of the style :— $\frac{1}{330}$  m.

From specimens preserved in spirits.

TAB. VIII.

*Phæocordylis areolata.*

- Fig. 1. Plant, reduced one-third, from a drawing from recent specimens by one of the native draftsmen of the Calcutta Garden.  
Fig. 2. Another view, partially altered from a pencil sketch by the same draftsman.  
Fig. 3. Portion of the head of the spadix.  
Fig. 4. Two of the paraphysiform hairs.  
Fig. 5. Abortive pistillum.  
Fig. 6. Stigma of the same.

Fig. 7. Another abortive pistillum.

Fig. 8. Somewhat immature fruit.

Fig. 9. Mature? fruit.

Fig. 10. Longitudinal section parallel to broadest diameter.

Fig. 11. The same, parallel to narrowest diameter.

Fig. 12. Nucleus detached: longitudinal section.

Fig. 13. Nucleus of another entire, resembling in some measure certain young dicotyledonous embryos.

Fig. 14. Portion of the nucleus, showing its composition.